FS Review Team Comments on Portland Harbor Draft Feasibility Study (March 2012)

No.	Comment Subject	Reference	Comment
1	Benthic Risk Evaluation	General	The evaluation of benthic risk will need to be updated to reflect any changes from completion of the BERA. The outstanding issues must be resolved in order to evaluate the protectiveness and long term effectiveness and permanence of the various remedial alternatives. Although the RALs evaluated in the FS will address the majority of contamination presenting risk to human health and the environment, the exception to this is the benthic risk areas. EPA will be providing direction on a multiple lines of evidence approach to identifying benthic risk areas. The discussions, figures, and evaluations presented in the FS related to benthic risk will need to be revised based on the guidance to be provided. In addition, the evaluation of protectiveness and long term effectiveness and permanence includes the use of long term modeling results averaged over a ½ mile area. A ½ mile area is too large to evaluate effects on the benthic community. Benthic-associated risks should be evaluated on a point by point basis.
2	Site-wide evaluation vs. relevant exposure areas	General	The FS includes too much focus on site-wide phenomena such as deposition and receptor exposures. Contaminant sources and types are not homogeneous site wide, and most exposures are not site wide, yet the FS frequently focuses analyses and presents conclusions at the site wide scale. For example, "the site is depositional" is frequently repeated. That assertion is not relevant or helpful to analyze the feasibility of response actions taken on specific areas, the scale where managing cleanup actions will occur. The draft FS aggregates exposure areas (i.e., site wide, segment-wide, or to the river mile) which is not environmentally or biologically relevant and effectively dilutes risk and unacceptable exposures. The FS analyses should focus on contaminated areas and exposure areas where exposures require management, not site wide. The LWG focuses on site-wide SWACs to evaluate alternatives. While the draft FS Report notes that it uses the "1-mile average basis, which is the smallest relevant spatial scale consistent with the risk assessment", this scale may not be relevant from the standpoint of evaluating remedial technologies. EPA disagrees with the LWG's claim that all alternatives (B-F) meet the NCP criteria because site-wide SWACs are not appropriate at this site. The use of site-wide SWACs allows substantial areas with higher and potentially problematic levels of contamination to be masked by areas with lower contamination, yet the exposure would remain.
3	Oregon Hot Spots and PTW	Section 5.5.1 - Potential Oregon Hot Spots, Table 5.5-1	ARARs - Hot Spots of contamination - Identification of Hot Spots as defined by Oregon's cleanup rules is an important ARAR in the Portland Harbor project for DEQ. Hot Spots are addressed in several sections of Oregon Hazardous Substance Remedial Action Rules (OAR 340-122). The basic intent of Hot Spot rules is to require a preference for treatment of highly contaminated material or highly mobile material. As discussed in DEQ's 1998 "Guidance for Identification of Hot Spots", the definition of Hot Spots depends upon the environmental medium that's contaminated. For media other than water (e.g., sediment), a Hot Spot exists if the site poses an unacceptable risk (threshold criterion)…, and if the contamination is highly concentrated, highly mobile, or cannot be reliably contained. Although some of the LWG's arguments in the draft FS regarding Hot Spot designation have merit, DEQ is still concerned that: 1) an attempt to identify high concentration Hot Spots in Portland Harbor has not been done; 2) high concentration Hot Spots may exist in Portland Harbor; and 3) some of those Hot Spots may not be covered by active remediation included in current remedial alternatives. The FS must identify high concentration Hot Spots in Portland Harbor. While the LWG's FS strategy may approach the intent of the Hot Spot rules, it does not answer the question of whether high concentration Hot Spots exist. If high concentration Hot Spots actually exist outside of areas currently designated for active remediation, then the very important state ARAR for preference for treatment will not be addressed. As has been stated in the past, DEQ is willing to work with the LWG to develop a reasonable approach for identifying high concentration Hot Spots, and then participate in decisions of how to address potential Hot Spots in the FS.
4	Oregon Hot Spots and PTW	Section 5.5.2 - Principal Threat Waste (PTW) Areas	Another omission in the FS is the lack of any meaningful analysis of principal threat waste in accordance with the NCP and CERCLA guidance. EPA guidance defines principal threat waste as a source material that is "highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur," such as drummed waste or pools of non-aqueous phase liquids (EPA 1991). Based on this definition, the Portland Harbor FS should clearly acknowledge that the documented presence of non-aqueous phase liquids in sediments off shore of the Gasco and Arkema sites indicates that Principle Threat Waste (PTW) is present at the Portland Harbor Site. Additional analysis of PTW will be conducted as part of the revised FS.

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5	ESA Consultation and Mitigation	General	LWG should note that mitigation under the Clean Water Act and ESA are not one and the same. Furthermore, for ESA mitigation NOAA will not be considering mitigation at the scale of the 4th field Hydraulic Unit Code. Upper Willamette River (UWR) ESA-listed salmonid stocks or Lower Columbia River (LCR) ESA-listed salmonid stocks (or the specific impacted life stages of these stocks) could be omitted. Because potential response actions in the LWR may adversely affect critical habitat for both UWR and LCR stocks, all such species and associated life stages (of the affected evolutionarily significant units/distinct population segments) must be taken into account when selecting mitigation sites intended as a measure for mitigating affects on critical habitat. In addition, the location where the critical habitat degradation occurs will be heavily considered when deciding on the appropriate location for mitigation. Mitigation for adverse affects on critical habitat within the Portland Harbor Superfund Site will be a priority for ESA purposes. NOAA will carefully review each individual proposed clean-up action in the harbor (and not the Portland Harbor remedy as a whole) during remedial design to ensure each action is protective of ESA-listed NOAA trust resources. Consequently, NOAA's Biological Opinion on EPA's Proposed Plan will not have an incidental take statement, but rather will defer to post-ROD supplemental consultations on specific remedial actions.
6	RAOs, RGs and RALs	General	Remedial Alternative G was developed to evaluate cleanup to "background" concentrations for chemicals including PCBs. However, LWG dropped the alternative relatively early in the FS because, according to the natural recovery assumptions in their analysis, it did not offer any benefit relative to Alternative F. Based on the concerns identified with the fate and transport model and MNR assumptions, a more robust analysis of Alternative G needs to be performed.
7	RAOs, RGs and RALs	General	Noncancer risks - Noncancer risks are not discussed with the same depth and frequency as cancer risks. The most important risk at the site is noncancer effects from PCBs on infants. (For example, Executive Summary, Conclusion, ES-31, second to last bullet.)
8	RAOs, RGs and RALs	Section 2.3 - Biological and Habitat Description, page 2-12	Page 2-12 and Ecological Risk Assessment Risk Lines/Areas: The text states "as discussed more in Section 3.1, Site contaminants currently pose potentially unacceptable risks to ecological receptors (e.g., the benthic invertebrate community and fish and wildlife populations) as detailed in the draft final BERA (Windward 2011). The primary ecological risks are from bioaccumulation of PCBs and other persistent contaminants by wildlife and their prey, which occur in addition to the direct risks to benthic communities from contaminants." An important note is that only risk to bioaccumulation of PCBs and benthic toxicity are mentioned as considered in the FS. There are other risk areas that occur over a more localized scale as indicated by comments on the BERA, that need to be brought into the FS. Due to the use of a large spatial exposure scale defined by a study area to most receptors and media and the large exposure area used in the risk assessment many localized areas exhibiting unacceptable risk were dropped (e.g. lines that represent HQ>1). Examples: a. Surface water RAO 7 (Section 3-14): Surface water lines of evidence were inappropriately dropped in BERA (see EPA BERA comments) and need to be brought back in. b. Tissue Residue: Localized areas with HQ>1 should have been identified in the BERA and should be added to the FS. Identify localized areas that potentially exhibit unacceptable risk that may be dropped by draft FS evaluation, and provide clear evaluation of risk in these areas.
9	RAOs, RGs and RALs	Section 3.2.1 - RAO Considerations, RAO 3, page 3-11	Carcinogenic PAHs exceed the 10-6 risk level based on a drinking water exposure scenario. In addition, although depth integrated surface water samples do not exceed MCLs, some near bottom samples do exceed MCLs for chemicals such as vinyl chloride and benzo(a)pyrene. The draft FS states that RAO 3 is already being achieved. This is not necessarily accurate. It would be better for the FS to acknowledge there is data indicating that there are sources, from uplands, groundwater, or sediments, that could have potential impact on the drinking water beneficial use of the Willamette River and remedial actions and upland source control efforts will need to take into account the need to protect the drinking water exposure pathway.
10	RAOs, RGs and RALs	Section 3.5 - PRGs and Proposed RGs, page 3-25	The text states "*the draft FS addresses all contaminants posing potentially unacceptable risk as identified in the baseline risk assessments as well as contaminants yielded from the EPA-required additional water screening steps described in Section 3.1.*" This statement is not accurate in terms of the ecological risk assessment. Not all contaminants posing potentially unacceptable risk were identified in the BERA and therefore are not contained in the FS.

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11	RAOs, RGs and RALs	Section 3.5.1 - PRGs, page 3-26	The text states "sediment PRGs were provided by EPA (EPA 2008b; Windward et.al. 2009). All of the PRGs developed for the draft FS, consistent with the most recent revisions of the risk assessment as well as a description of methods to calculate the PRGs, are presented in Appendix Da." Based on the comments on the BERA, the PRGs will likely need to be re-evaluated. These are some preliminary concerns: i. Problem formulation states BSAFs should have been developed for chemicals included in the food web model (e.g. PCBs, dioxins and DDX compounds). This analysis should have been included here, especially since some areas of concern represent localized areas (non-site wide). ii. PRGs for sculpin should be 0.1 mile of linear shoreline and not a centroid. This approach places too much emphasis on deeper water exposure that has not shown to correlate with sculpin habitat. iii. PRGs were developed using data from both sides of the river for smallmouth bass in 1 mile increments. This should be revised to include 1-mile segments restricted to one side of the river or the other. This approach dilutes exposure that occurs primarily from one side of the river.
12	RAOs, RGs and RALs	Section 3.5.1 - PRGs, page 3-26	The FS text states "the sediment data used to generate SWACs were based on the BERA dataset, which included a subset of data from the site characterization and risk assessment (SCRA) database." It is not clear why the dataset used to calculate appropriate SWACs for bioaccumulation modeling would be different than the SCRA database. The BERA dataset would presumably be much more limited to co-located tissue and bioassay stations.
13	RAOs, RGs and RALs	Section 4.2 - RAL Development Methods, page 4-5	The RAL evaluation methods focus on incremental SWAC reduction. The analysis should be focused on risk reduction rather that SWAC reduction. Risk reduction should be considered over a variety of exposure scales consistent with the risk assessment assumptions. The information in Table 4.3-1 illustrates this point since the SWACs are averaged across the river when much of the exposure may be taking place in the near shore areas. It may also be that much of the MNR is taking place in the near shore areas which tend to be depositional and dominated by fine-grained sediment rather than the higher energy navigation channel which experiences prop wash and sand waves and is dominated by coarse-grained sediments.
14	RAOs, RGs and RALs	Section 5.7 - Analysis of TZW Impacts in and near SMAs, page 5-30	The FS Report states on page 5-30: "The BERA recommended that only those TZW COPCs with an HQ greater than or equal to 100 be considered as COCs to develop and evaluate remedial alternatives that are protective of ecological resources." EPA has not agreed to this risk management determination. All chemicals in all media with HQ>1 should be considered in the FS.
15	SMAs	Section 5.3 - SMA Mapping Methods	There are some concerns about assumptions made in the interpolation of the SMAs, particularly in areas with low data density (see Section 5.3.3). For each contaminant, a buffer distance was developed from the average distance between sample points; the buffer was used to mask out any areas with interpolated concentrations above RALs that are beyond the buffer distance from any point. This may result in inaccurate acreages and estimates of volumes, particularly in river miles (RMs) 6-8. Additionally, it appears that the maps do not include all areas that exceed the RALs. The FS does not include areas where the average concentrations do not pose potentially unacceptable risks from benzo(a)pyrene, even if those areas do exceed the RALs (such as Swan Island Lagoon; see p. 5-4). The FS also does not include areas with benzo(a)pyrene and polychlorinated biphenyl (PCB) concentrations greater than the RALs outside of the areas of potential concern (AOPC) boundaries (see p. 5-8). There is no explanation of how many areas were removed, where they were, or what the nature of exceedances may have been. The areas outside AOPC boundaries with RAL exceedances should be included, or a clear explanation of why specific areas were not included should be provided.
16	SMAs	Section 5.6 - Evaluation of Buried Contamination	The potential for exposure of buried contamination from dredging or other erosive forces was only evaluated in designated future dredge areas (see Section 5.6.4) and the navigation channel (see Section 5.6.5). There is no analysis presented of all areas where buried contamination exists and information upon which one can judge where there is a significant potential risk of exposure of subsurface contamination. The FS should have developed a list of factors or criteria by which all subsurface contamination would be evaluated for the need for active cleanup or institutional controls to avoid exposure in the future.

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17	SMAs	Section 5.6.4 - Potential Future Maintenance Dredge Areas Outside of Navigation Channel, page 5-26	The draft FS states: Any potential FMD areas with an exceedance of more than two times the RAL in those horizons was added to its nearest surface SMA. Although EPA acknowledges the uncertainty, the factor of 2 times seems arbitrary. It is more defensible to use the RAL directly. Please revise to compare to the RAL instead of two times the RAL. FMD areas that are within SMAs should analyze a preference for removal similar to that applied to the navigation channel areas to address areas with the likelihood of potential exposure to eliminate risk of such threats rather than rely on subsequent 404 permit actions.
18	Fate and Transport Model/MNR	General	Many concerns have been identified related to the MNR modeling and conclusions, including those described below. In the broadest terms, EPA accepts the general precepts but not the outcome of the MNR modeling effort, results, and conclusions. Based on running independent models linking deposition to hydrodynamics, EPA believes that the LWG models results are sufficiently uncertain that out-year projections are not considered reliable. Due to the uncertainty in long-term estimates and small scale variability in the empirical MNR evaluation, the FS should rely primarily on the remedial outcomes immediately following construction. Rather than request revision of the model runs to address specific concerns, in conjunction with EPA's independent model runs, EPA intends to use the empirical and modeled results to support the evaluation of alternatives. The draft FS appears to rely on MNR for the majority of cleanup. The goal should be that SWACs over an appropriate exposure area achieve RGs (or background) at close to T=0 rather than at T=30 or 40 years. The evaluation of alternatives should rely on active remediation for the majority of cleanup and use MNR to continue to improve conditions, with monitoring to ensure that long term objectives are met.
19	Fate and Transport Model/MNR	General	Modeling in the FS indicates rapid reductions in contaminant concentrations in sediment via natural recovery (MNR). The primary mechanism driving the modeled reductions in contaminant concentrations is burial, a process by which cleaner sediment deposits on contaminated sediment, diluting and burying contaminated sediment over time. EPA determined that the model used to predict deposition of clean sediments does not account for the impact of deposited sediments on water flow and erosion. Put simply, during the 30-year model simulation, sediment continues to accumulate, but that change in water depth is never "seen" by the model. In effect, the model can predict the deposition of several feet of clean sediment (even to levels that would breach the water surface) with no associated change in the water velocity in that area. This aspect of the model does not reflect fundamental principles dictating sediment deposition over time: when water flow is constricted, the flow velocity increases along with erosive forces and transport of sediment. This shortcoming in the model framework suggests that deposition (and hence MNR, which occurs via deposition) is overpredicted, at least in certain portions of the river. Omission of a fundamental principle of hydrodynamics and sediment transport in the modeling framework in a water body where predicted reductions in depth due to deposition are significant in some areas greatly reduces the confidence in MNR predictions. EPA compared the model framework used in the FS (a version of "EFDC" that doesn't link [or feedback] sediment accumulation to hydrodynamics) to a version of EFDC that links sediment accumulation and bathymetry changes to hydrodynamics. The purpose was to understand if the deposition over time predicted by these frameworks varied, and, if so, how. All other modeling aspects were kept the same as the original FS (e.g., the model grid, initial conditions, and sediment and hydrodynamic parameters). The changes in bed elevation (i.e., the amount of deposition or erosion) predicted by each model over the 30 year run time were compared. Results indicate that the FS model showed greater deposition than the linked model (defined as greater than 0.5 ft) in 55% of the cells, with results ranging from 6 inches to greater than 20 feet more deposition. The models show similar deposition (+/- 0.5 ft) in 40% of the cells. In 5% of the cells, the FS model showed less deposition (or greater scour) than the linked version of EFDC. If there was no bias one way or the other between models, the values greater or less than 0.5 ft would be equally distributed. However, results show a strong bias for greater deposition by the MNR model used in the FS.
20	Fate and Transport Model/MNR	General	MNR Effectiveness: Many of the MNR effectiveness lines of evidence demonstrate that MNR may be effective in some areas of the site. This is based on a review of incoming sediment concentrations, surface to subsurface sediment ratios, bathymetric change maps and grain size analysis. However, it should be noted that MNR is unlikely to be effective at all locations. For example, just off shore of the Gasco site, the surface sediment PAH levels are much higher than subsurface sediments. This is also an area that is dominated by coarse grained sediments. These lines of evidence suggest MNR may have limited effectiveness in the vicinity of the Gasco site.

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21	Fate and Transport Model/MNR	General	Concerns associated with the fate and transport models and MNR conclusions include the following: MNR Effectiveness: The effectiveness of MNR was evaluated by empirical lines of evidence and predictive modeling using a hydrodynamic model, sediment-transport model and contaminant-fate model. Many of the empirical lines of evidence are overly generalized and may not hold true on smaller scales. The modeling concludes that the harbor is "net depositional" (Appendix La, p. 50) based on averages for the site as a whole. However, the spatial and temporal patterns of erosion and deposition in localized hot spots and SMAs are critical to predicting sediment COC concentrations. Monitoring of sediment from 2003 to 2009 (Figure 6.2-1) indicates that many of the highly contaminated areas, including along the banks, are net erosional. The one river mile reach scale is too coarse to be meaningful. For example, between RM 11 and 11.8, the analysis concludes that this reach is generally not likely to recover. However, there are significant differences between the east and west sides of the river due to anthropogenic effects such as dredging and propwash. As a result, the west side of the river is likely to recover more quickly than the east side. Similarly, the draft FS report notes the variability within RM 5 – 6: The upper portion contains mostly Category 2, with some Category 3 and Category 1 areas, while the lower portion is mostly Category 3, with some Category 2 areas." This variability should be taken into account when mapping the SMAs (e.g., incorporate into the Figure 5.8-1 series), screening remedial technologies and evaluating remedial action alternatives. However, overall, the reaches identified as category 1 and 2 (RM 5 – 7, RM 11 – 11.8 and Swan Island Lagoon) appear to be the primary areas where MNR is less effective. It should be further noted that these areas incorporate many of the primary source areas at the site (RM 11E, Portland Shipyard, Arkema, Gasco/Siltronic and Willamette Cove).
22	Fate and Transport Model/MNR	General	The draft FS Report states: "Expected changes in surface sediment concentrations due to river current erosion are relatively small and short in duration and, under the no action alternative, do not substantially alter the course of natural recovery as generally observed at the Site. There does not appear to be a need to identify any new areas of currently buried contamination that would have substantial impact on surface sediment concentrations. The extent to which any such erosion is expected to occur is fully integrated into and accounted for in the long-term surface sediment modeling results presented in Sections 6 and 8. Therefore, the importance, or lack thereof, of this process in terms of remedy success can be fully assessed via evaluation of the model results." If buried contamination is not a concern, then what is the explanation for elevated levels of PAH and DDx contamination offshore of the Gasco and Arkema sites respectively, despite the fact that the releases to the river ceased in the 1950s. Additionally, given the amount of maintenance dredging that has occurred at River Mile 11E, and if significant sources have been addressed as represented, why is there still such significant surface contamination? Subsurface contamination requires serious consideration to evaluate its potential to pose unacceptable risk currently and in the future and ultimately to determine cleanup areas and remedial technologies. Analysis of the extent and magnitude of potential exposures to these materials should not be relegated "fully" to and then dismissed by the sediment modeling (particularly modeling approaches that do not account for the impact of bed morphology changes on deposition rates over time). Site-specific circumstances must be objectively evaluated. Also, exposed concentrations immediately following the 100 year event should be depicted; to bracket these results, the 100 year event should also be run at year 0 and results presented.
23	Fate and Transport Model/MNR	Section 2.1.1 - Hydrology, page 2-3	The draft FS Report states: "The draft final RI also estimated that the Portland Harbor area stormwater runoff volume contributions are between 0.06 percent for the wet year conditions (1997) and 0.08 percent for dry year conditions (2001) of the total Willamette River flow." While this information is accurate, it should also be noted that short term stormwater discharges can be a higher percentage of flow than the average flow conditions described above.
24	Fate and Transport Model/MNR	Section 2.6.2 - Chemical Distribution, page 2-41	The FS Report states: "Most areas of elevated contaminant concentration in bedded sediment are located in relatively stable nearshore areas, and large-scale downstream migration/dispersal of concentrated contaminants from these areas is not indicated by the bedded sediment data." This statement is contradicted by the distribution of PAH and DDx contamination at the site which shows a clear pattern of downstream migration from the large sources present in the vicinity of RM 6.

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25	Fate and Transport Model/MNR	Section 2.6.3 - Sources, Fate and Transport, page 2-41	While it may be true that most of the sediment contamination at the Site is associated with known or suspected historical sources and practices that have largely been discontinued or otherwise controlled, there are instances, such as the Gasco and Arkema sites where ongoing migration of contamination from upland sources continue to serve as a source of in-water sediment contamination. In addition, while it also may be true that "For PCBs and DDx, the main external ongoing sources quantified for the draft FS are upstream surface water inputs encompassing all upstream watershed sources" it is also true that localized sources of PCB and DDx contamination associated with upland sources exist within the Portland Harbor study area. Examples include PCBs in stormwater at the Schnitzer site and in USGS stormwater samples near St. John's railroad bridge[1], and the aforementioned DDx contamination at the Arkema site. The FS report seems to acknowledge this possibility with the following statement: "However, stormwater sources may have localized impacts on bedded sediment concentrations, although this effect is difficult to quantify on the scale of the entire Site." The presence of ongoing sources of contamination from a variety of sources should be explicitly acknowledged when assessing the effectiveness of MNR at the site based on application of the site-wide fate and transport model. In addition, the impacts from ongoing sources need to be evaluated on a more relevant scale than site-wide. 1) Morace, J.L. 2012. Reconnaissance of Contaminants in Selected Wastewater-Treatment-Plant Effluent and Stormwater Runoff Entering the Columbia River, Columbia River Basin, Washington and Oregon, 2008-10. U.S. Geological Survey Scientific Investigations Report 2012-5068, 68 p.
26	Fate and Transport Model/MNR	Section 2.6.3 - Sources, Fate and Transport, page 2-43	The major fate and transport properties described on Page 2-43 should include physical mixing and bioturbation which could have an effect on contaminant distribution.
27	Fate and Transport Model/MNR	Section 4.3 - RAL Range Selection and Detailed Methods by COC, page 4-8	The Portland Harbor Fate and Transport Model predicts that significant reductions in contaminant concentrations will take place within 10 years even under the no action scenario. However, data collected at the site over the past 10 years does not show appreciable reduction in contaminant concentrations. This demonstrates the uncertainty in the long-term predictions generated by the fate and transport model. As a result, the evaluation of remedial action alternatives should be based primarily on the T=0 risk contaminant concentration reduction curves. For example, the total PCB RAL curve for RM 11 – 11.8 presented in Appendix Db shows significant levels of reduction associated with the various RALs for the T=0 curve but does not show any reduction for the T=10 year curve as acres subject to active remediation increase. It should be further noted that this reach of the river is not particularly depositional in the area where the contamination is present (See Figures 2.1-2 and 2.1-3) and is subject to anthropogenic effects (prop wash and maintenance dredging) which are expected to limit the effectiveness of MNR. The fact that the model results do not show any decrease in contaminant concentrations associated with the T=10 year curve demonstrates that this curve should not be used to evaluate remedial action alternatives at the Portland Harbor site.
28	Fate and Transport Model/MNR	Section 5.6.1 - Erosion Due to River Currents, page 5-22	The draft FS states: "Expected changes in surface sediment concentrations due to river current erosion are relatively small and short in duration." While this statement is true due to the likelihood of the deposition of clean material as currents slow and material drops out of suspension, the potential for contaminated material to be scoured and transported downstream exists.
29	Fate and Transport Model/MNR	Section 5.6.3 - Wind/Wake Wave Generated Erosion, page 5-24	Wind and wake driven waves are likely to be significant especially given the seasonal changes in river elevation. This change in river stage will tend to expose a significant bank zone to waves of sufficient strength to generate erosional forces that must be considered in the FS. A clear and more detailed consideration of wind and wave erosional forces should be included in this section.
30	Fate and Transport Model/MNR	Section 6.1 - Identification of Technologies, page 6-2	The discussion of MNR should note that deposition by clean material is the primary natural recovery process at the Portland Harbor site (and other sediment sites nationally). The discussion of in-situ treatment should note that in-situ treatment in combination with EMNR may be effective for both chemical and physical isolation of contaminants.
31	Fate and Transport Model/MNR	Section 6.2 - Screening of Remedial Technologies, Figure 6.2-15	Instead of portraying the surface/subsurface ratios onto the model grid, individual sediment core results should be mapped to develop surface/subsurface rations. If feasible, depicting thiessen polygons of the surface/subsurface rations should be developed

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32	Fate and Transport Model/MNR	Section 6.2.2.1 - MNR Effectiveness, page 6-8 and Figure 6.2-19	The temporal trend data needs to correct for the sample locations. For example, at RM 1.9 – 3, most of the later samples were collected outside the main area of PCB contamination. The McCormick and Baxter data, while reflecting a long time period, also incorporates the timeframe of the sediment cleanup which took place in 2005. Furthermore, in the early 1990s, McCormick and Baxter was in the process of being shut down and the equipment and buildings abandoned. If the 1990 data is eliminated from the analysis, there is virtually no temporal change noted in benzo(a)pyrene and naphthalene levels. The early 1990s data should be excluded from the evaluation because it is likely to be impacted (by increased concentrations) by the remedial actions.
33	Fate and Transport Model/MNR	Section 6.2.2.1.2 - Predictive Modeling Tools, page 6-22	The statement "These models have been EPA approved" is misleading, as it implies that EPA has approved the results of the model runs for the Portland Harbor Site.
34	Fate and Transport Model/MNR	Section 6.2.2.1.3 - Weight-of-Evidence Assessment of MNR Effectiveness, page 6-22	In general, weight of evidence (WOE) approaches can be well-suited for evaluating the relative strengths and weaknesses of remedial alternatives, but only when inconsistencies between lines of evidence (LOE) are addressed and each LOE is assigned an appropriate weight and significance in the overall framework. In the case of the WOE analysis for MNR in the Site, EPA has identified flaws that lead to overly optimistic predictions for MNR success. The following revisions should be made to produce a more reliable analysis: • Future Maintenance Dredge areas should all be ranked as Category 1 (unlikely to recover) rather than assigning shallow-use areas to Category 2. Any dredging at all would be sufficient to disrupt MNR: it does not matter if the target final depth is 10 ft or 50 ft, it only matters how much is being taken off in a single dredging event. • Net sedimentation rate (NSR) (page 6-25): "Areas within the uncertainty range of the surveys were assigned to Category 2". This is not consistent with the description of Category 2, which states: "Category 2 was assigned to areas where a given LOE suggests that natural recovery will likely occur, but the degree of effectiveness is less certain." This LOE does not suggest that natural recovery will "likely occur" if the surveys are not observing net sedimentation. Such areas should be Category 1. • Surface/Subsurface concentration ratios: it is fine to use PCBs as a surrogate for screening purposes, but this should be verified to ensure that locations with ongoing sources of other contaminants are not left to MNR. • "Areas where ... subsurface concentrations are within a factor of 1.5 of the [surface] concentrations... were assigned to Category 2." As noted for the NSR LOE, this indicates that concentrations are approximately stable over time, thus recovery is not occurring, so such areas should be reclassified as Category 1. • Model-predicted half-lives: using 10 and 20 years as cutoffs for half-lives is arbitrary and not justified. Rather than looking at half-lives, it would make more sense to look at time to meet target concentrations. EPA understands that the model has already been run for this question. If it is too complex to do this for all contaminants, then an alternative would be to use PCBs as a surrogate as was done for the surface/subsurface concentration ratios.
35	Fate and Transport Model/MNR	Section 6.2.2.1.3 - Weight-of-Evidence Assessment of MNR Effectiveness, page 6-24	"...because biological mixing processes measured at the Site (and incorporated into the predictive model) are also taken to extend to a depth of one foot, surface mixing associated with prop wash would have no net effect on the effectiveness of MNR in this setting." This statement is false because prop wash could resuspend contaminated sediment and transport it elsewhere.
36	Fate and Transport Model/MNR	Section 7.3.2 - MNR, page 7-7	Because some areas are already below the likely remedial goals, "It should not be assumed that MNR is a necessity in all areas of the Site-wide AOPC, although for the purposes of this draft FS, MNR is assessed throughout the Site." Site-wide monitoring will still be necessary to see whether contamination is being redistributed around the Site and to assess exposures for receptors that use a broad area of the river.
37	Fate and Transport Model/MNR	Appendix La, Section 2.3.2.3, page 17	Equation 2-29 gives the erosion rate based on shear stress. How does Equation 2-30 relate (i.e. when do we use it)?

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38	Fate and Transport Model/MNR	Appendix La, Section 2.3.2.3, page 17	Refers to Figure 2-17. Particle diameters in text do not match those shown in figure. Please provide edits to match diameters in text to those in figure.
39	Fate and Transport Model/MNR	Appendix La, Section 2.3.4, page 35	Erodibility parameters are averaged over the whole Site for cohesive bed areas. Therefore, in the places with above average erodibility (i.e., in about half the cores, and in areas of the river with similar bed characteristics to these cores), the model will erroneously predict no erosion at some times. Table 2-6 shows that the critical shear stress ranges from 0.09 to 0.73 with an average value of 0.30. Erosion should be evaluated on a smaller-scale area.
40	Fate and Transport Model/MNR	Appendix La, Figure 2-75	The method of calculating the statistics of the absolute difference in net sedimentation rate is not appropriate. Using this method, over-predictions and under-predictions cancel out so it cannot show how accurate the model predictions were, only whether they had an overall bias. Instead, after step 1, generate a third data set which is the absolute value of the difference between the predicted and measured value in each zone. Then take the mean of that data set. That will estimate how well the model matches the measured sedimentation on a given spatial scale.
41	Fate and Transport Model/MNR	Appendix La, Section 2.3.6, page 41	"The first step in this evaluation was determining qualitative agreement between erosion and deposition areas (e.g., if the model predicts net deposition in a specific grid cell, is the prediction consistent with the data-based bed elevation change?)." Table 2-15 suggests that 2.5 cm/yr was used as the criterion for "qualitative agreement". This is a large margin given that the criterion in Section 6.2 for categorizing an area as "likely to recover" (Category 3) was >1 cm/yr of sedimentation. If the model accuracy is ~2.5 cm/yr, then an area classified as Category 3 may actually be experiencing net erosion of 1.5 cm/yr. This is the main problem with the sediment modeling. The approach is acceptable, and the accuracy may be as good as any model could possibly be, given uncertainty on all the inputs and measurements, but it's overly optimistic to use it to try to give a sedimentation rate to within 1 cm/yr. Although this approach is acceptable, the draft FS should acknowledge uncertainty associated with estimating sedimentation rates to within 1 cm/yr.
42	Fate and Transport Model/MNR	Appendix La, Figure 2-79	This figure should be corrected to match the text on page 46 or else vice versa. The runs listed in the text (7, 11, 12, 26) are not the ones shown here (7, 9, 12, 26).
43	Technology Evaluation - EMNR	Section 6.3.2.1 - EMNR Effectiveness, page 6-34	The discussion of the effectiveness of EMNR should take into account anthropogenic impacts. Due to dredging and propwash, it seems unlikely that EMNR would be effective in the RM 11E area. Propwash should also be taken into account in assessing the effectiveness of EMNR in Swan Island Lagoon.
44	Technology Evaluation - EMNR	Section 7.3.2 - MNR, page 7-6	The draft FS Report states: "areas of active remedy (SMAs) were not expanded to include areas of potentially limited natural recovery except in SMA 17S (Swan Island Lagoon)." Areas where MNR is not expected to occur to a significant degree should be targeted for EMNR in a manner similar to the approach taken for SMA 17S in areas where EMNR is expected to be effective and implementable and in areas where RGs are exceeded.
45	Technology Evaluation - In-Situ Treatment	General	No pilot or field scale treatability studies have been proposed in the FS. Treatability studies may be appropriate during remedial design depending on the selected remedy.

No.	Comment Subject	Reference	Comment
46	Technology Evaluation - In-Situ Treatment	Section 6.2.4.1.2 - Grasse River, New York, page 6-40	Bullet #3: "All of the delivered AC remained in place throughout the post-placement monitoring period." This is not accurate, according to the Activated Carbon Pilot Study Construction Documentation Report (2007) which states "on average, approximately 30 to 50 percent of the activated carbon mass applied to the Grasse River surface sediments was recovered in post-application samples using the BC-C technique…Small-scale spatial variability in the application of activated carbon is likely a significant contributing factor to the observation of unaccounted mass identified through the post application sampling results." It appears that the small-scale variability contributes to the lack of closure on the mass balance, but being able to account for only 30-50% of the mass of a material added to the river, in conjunction with not finding AC in sediment at depths greater than 3 inches, strongly suggests that AC was carried away from the test site. If AC is proposed for use at Portland Harbor, a pilot study to assess placement techniques would be needed.
47	Technology Evaluation - Capping	General	The placement of numerous caps within Portland Harbor may have a cumulative effect on river dynamics at the site. The FS should consider the effect of multiple capping remedies on river dynamics, flood stages and flood storage. In addition, the impact of any changes in river dynamics should be incorporated into the fate and transport model used in the FS to support the evaluation of MNR.
48	Technology Evaluation - Capping	General	The effectiveness evaluation for active capping assumes that groundwater plumes in SMAs 9U and 14 will be controlled and will naturally attenuate. Ongoing contamination from groundwater may affect the short-term (and possibly long-term) effectiveness of active capping. Discuss the timeframe for attenuation and potential impacts on effectiveness of capping.
49	Technology Evaluation - Capping	Section 6.2.5.1 - Capping Effectiveness, page 6-46	The capping effectiveness evaluation should consider hydrophobic, bioaccumulative contaminants with low human health AWQC such as PCBs in addition to the more mobile groundwater contaminants such as benzene, chlorobenzene and vinyl chloride. Points of compliance should be pore water concentrations at the groundwater/surface water interface rather than a depth integrated surface water prediction to account for bottom feeding fish and epibenthic invertebrates.
50	Technology Evaluation - Capping	Section 6.2.6.2 - Implementability (Reactive capping), page 6-54	The reactive capping effectiveness discussion should note that reactive capping may reduce the overall thickness of the cap thus allowing placement in areas that would otherwise not be capable due to water depth requirements.
51	Technology Evaluation - Dredging	General	The LWG applies numerous assumptions regarding the use of remedial dredging actions that introduce biases against dredging alternatives. These biases tend to portray the more dredging-intensive alternatives as far less desirable than information from other dredge projects portray. • For example, the draft FS assumes that no in-water remedial actions can occur outside of the in-water work window extending the length of time to complete these actions. However, this is not necessarily the case. NOAA has indicated they would support such actions so long as isolation management measures could be implemented in the work area to prevent or substantially reduce salmonid exposures to contaminants. • The draft FS apparently also assumes that dredging technologies would be limited to mechanical dredges, though other dredge technologies could also be utilized where appropriate. For example, in some areas of the Site, hydraulic dredging would be faster and result in fewer and/or reduced contaminant releases. • The draft FS also relies on the assumption that dredging operations would be limited to reliance on three simultaneously operating dredge plants, an assumption that seems arbitrary and overly conservative. • The sequencing of the dredging in the draft FS alternatives does not seem logical in some cases: some of the graphs do not depict large reductions in contaminant levels until many years after remediation begins. EPA maintains that areas with higher contamination should be removed first to achieve such early reductions. • Release predictions are excessive: An estimate of 3% release of material at 100% soluble is excessive. Taken cumulatively, these assumptions unrealistically increase the duration of many Site remedial alternatives, in particular those that rely more heavily on dredging actions. EPA believes that a recalibration of these assumptions would introduce reasonable, cost-effective and practicable alternatives that would allow for the removal of larger volumes of more contaminated sediments, thereby producing more substantial reductions in ecological (and human health) risks.

No.	Comment Subject	Reference	Comment
52	Technology Evaluation - Dredging	Section 6.1 - Identification of Technologies, page 6-3	The FS Report states: "Specifically, a wide range of experience at other sites has demonstrated that resuspension of contaminated sediment and release of contaminants occurs during dredging, and that contaminated sediment residuals will remain after operations." While this statement is true, the discussion should also note that resuspension and release may be controlled through the use of water quality controls such as sheet piles and silt curtains and that residuals may be managed by placement of a clean sand layer as soon as is practicable following completion of dredging activities. Additionally, Section 6.2.7.3 on Best Management Practices (BMPs) inappropriately disregards some technologies. Silt curtains and rigid containment should continue to be considered as BMPs in areas where they may be effective, particularly as controls on suspended sediment. The use of engineering controls to lessen releases from dredging should not be screened out, rather employed judiciously in areas of high contaminant concentrations in conducive environments.
53	Technology Evaluation - Dredging	Section 6.2.7.2.1 - Structure/Access Issues, page 6-59	EPA disagrees that all structures affect implementability of dredging. EPA disagrees with the sub-SMA limitations in Section 6.2.7.2.1 in that structures should be evaluated for the potential for removal or replacement, rather than simply assuming that removal is infeasible in their vicinity. LWG bases this assumption on the costs of removal and replacement of structures, which is more appropriately addressed under costs. A review of structures should be conducted to see which are potentially removable or replaceable. Particularly, the FS must evaluate structure removal where structures are derelict and not in use, or cannot be used due to safety concerns, or have a limited useful life, and combined with high concentration contamination that would not be effectively addressed due to the structures' existence.
54a	Technology Evaluation - Dredging	Section 6.2.7.3 - Removal Best Management Practices (BMPs), page 6-67	The evaluation of dredging in the FS over emphasizes the short term impacts of dredging-based remedies, under estimates the effectiveness and implementability of sheet pile enclosures, and over estimates the length of time that dredging would be required. The draft FS argues against the use of silt curtains and sheet pile walls as dredge BMPs, but for the following reasons, EPA believes that silt curtains and sheet pile walls should be retained as options for remedial design in order to facilitate dredging in areas of higher contaminant concentrations. 1. Containment devices such as sheet pile walls and silt curtains will limit the spread of dredge residuals, thus enabling higher production rates and decreasing the total time needed to reach cleanup goals while minimizing adverse impacts to biota. Effective containment of contamination during dredging may allow dredging to occur outside the fish window, further accelerating the pace of cleanup. 2. The objections raised in the draft FS to the use of sheet pile walls and silt curtains can be overcome. • The draft FS predicts that high flow and scour near silt curtains will decrease their effectiveness: "Dissolved phase and particle bound PCBs were found to have migrated beyond the containment" because the "concentrated flow conditions beneath the silt curtains resulted in localized scour and resuspension" at Grasse River and the "double silt curtain system was abandoned after being determined to be ineffective due to variable current speed and direction" at Massena. Flow conditions on these rivers are not necessarily the same as those in potential dredging footprints at Portland Harbor. Most of the areas in Portland Harbor with high contaminant concentrations (i.e., the areas most likely to be dredged) are near the riverbanks and thus have lower current speeds and a lower probability of release. • The draft FS predicts problems with stability of sheet pile walls due to scour. This can likely be overcome: for the dredging project on the Passaic River, flow modeling was conducted to determine likelihood of scour, and concrete pads were placed around the walls to prevent scour and stabilize the walls. Similar methods could be used at Portland Harbor if needed. • The draft FS describes the potential for silt curtains and sheet pile to obstruct boat traffic. This impact will depend on the location of the containment devices with respect to the navigation channel and should be minimal at Portland Harbor. The Hudson River silt curtain was placed across the entire river channel and had to be opened frequently to allow boat traffic. At Portland Harbor this could be avoided, as the areas to be dredged are near the riverbanks and small enough to allow temporary isolation from the rest of the river (i.e., boats could go around without requiring the curtains to be moved). **(Comment continued below)**

No.	Comment Subject	Reference	Comment
54b	Technology Evaluation - Dredging	Section 6.2.7.3 - Removal Best Management Practices (BMPs), page 6-67	**(Continued from Comment #54a)** • The draft FS predicts difficulties with installing sheet pile amidst riverbed debris. A recent dredging project on the Passaic River successfully placed sheet pile in an area of large heavy debris pieces including discarded appliances, demonstrating that it can be done. They conducted reconnaissance using side-scan sonar to help with placement. • The draft FS describes the potential for installation or removal of sheet pile to release contaminants. This can be ameliorated by placing the sheet pile farther out around the boundary of contamination. • The draft FS describes the potential for contamination to leak out through gaps in a sheet pile barrier and cites Hudson River as an example of leakage problems. The containment at Hudson River, while imperfect, was better than no containment at all, and the EPA review of Hudson River's Phase 1 Operations (http://hudsondredgingdata.com/documents/pdf/EPA%20Oversight%20Report%20Final.pdf) concluded that containment should continue to be used. Acknowledging the possibility of leaks, monitoring should be conducted during dredging to evaluate the effectiveness of containment devices. • The Fox River dredging project is removing material at a rate of 30K cy/week. • Cleanup activities at OU-1 of the Fox River site have resulted in rapid declines in fish tissue levels. It should be noted that contaminants were successfully contained during the removal action at Gasco several years ago. All this information suggests that removal based remedial technologies implemented with appropriate containment measures can be effective in meeting RAOs. Silt curtains and sheet pile walls should be retained as options for remedial design. The FS should reevaluate the use of silt curtains and sheet pile walls as options for reducing short term impacts and allowing dredging to take place outside the in-water work windows. This evaluation should take into account the experience at other sites as described above and summaries of this information should be included in the text.
55	Technology Evaluation - Dredging	Section 8.2.2 - Overall Protection of Human Health and the Environment, pages 8-10 and 8-27, Figure 8.2.2-1	The plots presented in Figures 8.2.2-1 through 6 show that there is essentially no reduction in surface sediment concentrations associated with Alternative F-r (the most aggressive alternative evaluated in the draft FS Report) until year 25. Even accounting for the releases during dredging activities, it does not seem reasonable to assume that no reduction in surface concentrations are achieved despite many years of active remediation. The BMPs described in the FS such as the use of silt curtains or sheet pile containment and the placement of clean backfill immediately following dredging activities should improve the overall effectiveness of dredging. At OU-1 of the Fox River site, where neither silt curtain nor sheet pile controls were required during dredging activities, fish tissue concentrations declined rapidly in response to the cleanup action. As stated in Lower Fox River Operable Unit 1: Post-Remediation Executive Summary: " The OU1 remedy was implemented from 2004 through 2009 and resulted in a reduction of PCB concentrations in 2010 for the three media of interest: fish, sediment, and water." And "For walleye, the ROD remedy versus natural recovery reduced the PCB fish tissue concentration by 73%. That is, the natural recovery remedy for walleye would reach this same level of PCB fish tissue concentration in approximately 15 to 20 years." These sort of results demonstrate the long-term effectiveness of dredging as a component of sediment remedies. The failure of the draft FS to document these reductions demonstrates the bias associated with the long-term effectiveness evaluation of dredging in the draft FS.
56	Technology Evaluation - Dredging	Section 8.2.2.4 - Dredging/ Removal, page 8-15	Increases in fish tissue concentrations are temporary (Fox River and Hudson River results showed elevated concentrations for one year and then an improvement). The draft FS overstates this occurrence as a reason not to dredge.
57	Technology Evaluation - Dredging	Section 8.2.4.2.4 - Long-Term Effectiveness – Dredging/ Removal, page 8-29	The discussion of the effectiveness of dredging in the draft FS Reports states: "With respect to the magnitude of residual risk, environmental dredging/removal may provide moderate to high level of risk reduction and low to moderate residual risk, depending on the effectiveness of dredging and use of backfill material. With respect to the adequacy and reliability of controls for residual risk, this technology may provide high control due to removal of contaminants, if residual contamination is below cleanup levels or addressed through post-dredge covers or capping (if needed)." Clearly, dredging can be effective with the use of post-dredge covers or capping; overall, the draft FS downplays the effectiveness of dredging technologies.
58	Technology Evaluation - Dredging	Appendix Ia, page 1	Re: "Model inputs included SMA-specific sediment data and river conditions and considered a range from the average to the maximum bulk sediment contaminant concentration in each SMA for the contaminants listed in draft FS Appendix C." Please provide a description of how "bulk sediment contaminant concentration" was calculated as this may influence model projections (including associated TSS concentrations). Also provide a table of the concentrations used as model inputs as bulk sediment concentrations may not be indicative of contaminant concentrations suspended while dredging in localized hotspots.

No.	Comment Subject	Reference	Comment
59	Technology Evaluation - Dredging	Appendix Ia, page 3	Re: "Background water concentrations were added to the computed constituent concentration as described above." Please provide a table of background water concentrations used as model inputs.
60	Technology Evaluation - Dredging	Appendix Ia, page 5	Re: "Input values used for these variables were developed by averaging available Site and geotechnical data within the evaluation area." Model sensitivity analyses should be conducted using site and geotechnical data that will provide "best- and worst-case" resuspension and sediment transport scenarios. These scenarios will aid in the evaluation of sediment management practices (i.e., rigid containment, silt-curtains, monitor only) that may be required to assess downstream contaminant transport as a result of dredging activities under the range of conditions expected to be encountered during the dredging work window.
61	Technology Evaluation - Dredging	Appendix Ia, page 5	Re: "Background TSS concentrations were neither evaluated nor included in the DREDGE-calculated TSS concentrations." Please provide justification as to why background TSS concentrations were excluded from DREDGE model simulations.
62	Technology Evaluation - Dredging	Appendix Ia, page 6	Re: "Additional evaluations were performed using a range of DREDGE input variables (bucket size, specific gravity, lateral dispersion coefficient, river velocity, and particle size) in a preliminary sensitivity analysis for these parameters." Please provide all input variables and output from sensitivity analyses to allow for more in-depth evaluations of model projections.
63	Technology Evaluation - Dredging	Appendix Ia, page 7	Re: "Sensitivity analyses on individual input variables discussed in the Table 2 notes indicate that TSS values could increase by a factor of 2 or more when modifying individual variables; however even with the increased TSS results, no further exceedances were noted by the sensitivity evaluation." There is no discussion or presentation of values used for the various inputs during sensitivity analyses in Table 1. A table of all input variables and associated outputs used during sensitivity analyses should be provided and the existing sentence in the appendix should be removed.
64	Technology Evaluation - Dredging	Appendix Ia, Table 1	Exceedance thresholds and their corresponding sources should be presented in Table 1.
65	Technology Evaluation - Dredging	Appendix Ib, page 2	Re: "Because the use of multiple cleanup passes has been demonstrated to be ineffective, the FS does not consider this practice appropriate at this Site." To the extent feasible, the possible use of multiple cleanup passes should be evaluated using the model.
66	Technology Evaluation - Dredging	Appendix Ib, page 4	Re: "The overdredge sediment was assumed to be at a concentration at or below the RAL." The assumption that the overdredge sediment will be at or below the RAL is not conservative. The contaminant concentrations in the overdredge prism should reflect the concentrations in overdredge sediments anticipated to be encountered in the field following dredging. Furthermore, please specify whether the concentrations are assumed to be either AT or BELOW the RAL, as this distinction could have a significant impact on model projections. The anticipated overdredge contaminant concentrations should also be provided in a table for each dredge area so that a more in-depth review of model projections can be performed.
67	Technology Evaluation - Dredging	Appendix Ib, page 4	Re: "After placement as residuals cover, the material was considered to partially mix with the residuals layer (since the residuals cover would not be designed to function as an isolation cap…" Please specify to what extent and depth mixing of the residuals and cover materials is expected to occur. Also provide the basis for whatever extent and depth of mixing is assumed.
68	Technology Evaluation - Dredging	Appendix Ib, page 5	Re: "The mixing calculation assumes that residuals cover will reduce the surface concentration by approximately 90 percent…" The mixing assumption appears to meet RALs primarily by "diluting" the residual sediment matrix with clean materials. Sediments exceeding RALs following dredging should be capped using engineered isolation caps, not assumed to simply mix with cover materials. This is an overarching comment for the entire appendix.

No.	Comment Subject	Reference	Comment
69	Disposal Options	General	Construction of CDFs and/or CADs may impact habitat. Costs associated with habitat mitigation for CDFs and/or CADs should be included in the cost estimates. The evaluation of implementability must consider Oregon Department of State Lands (DSL) necessary agreements to allow CDF/CAD facilities. On-site CADs and CDFs will need to consider the potential for measureable increase in flood risk and measureable decrease in flood storage. The implementability evaluation should provide more detail regarding these substantive requirements and how that will be addressed during remedial design if/when a disposal site is selected.
70	Technology Evaluation - Assignments	General	Selection of specific technologies within integrated alternatives. It is unclear how specific technologies were designated for individual sub-SMAs. Descriptions in Section 5-4 and technologies Table 7.2-1 are somewhat helpful, but it does not make clear which remedies will be applied for what reason or under what conditions. If this material is in an Appendix somewhere, it should be brought forward as it is fundamental to evaluating alternatives. The lack of consideration of environmental conditions for selecting some remedies is disconcerting. For example, it appears that in-situ treatment is designated for open water areas without consideration of sediment slope or water flows. Language in Chapter 7 seems to relate that all integrated remedies would be interchangeable. A new table or figure should be developed that clearly depicts the decision tree for determining which remedies are applied in which areas for what reason. The text should further explain and support this process. At present, the presentation of this fundamental component of the FS is unclear and inadequate. If it is not relevant or necessary to designate specific remedies among the “I” alternatives, this should be described in a clearer fashion than the text presented on page 7-4.
71	Technology Evaluation - Assignments	General	Sub-SMAs - We agree that information about uses is useful for determining the feasibility of remedial technologies. However, we disagree that all structures affect implementability of dredging. A review of structures should be conducted to see which are potentially removable or replaceable. In addition, the use of specialized dredge equipment (e.g., excavators with narrow buckets) should be considered for removal around structures.
72	Technology Evaluation - Assignments	Section 7.2 - Remedial Technology Options, page 7-4 and Table 7.2-1	The draft FS Report states: The assignment of technologies for removal versus integrated options is summarized in Table 7.2-1. However, the factors considered for the purpose of identifying the various sub-SMAs is limited. There are a number of key site specific factors that are not taken into account when designating sub-SMAs. These include erosion/deposition areas, current and future land and waterway use, contaminant mobility, potential hot spots of location, etc. Use of a more comprehensive set of physical, contaminant and land and waterway use characteristics will allow for development of a more refined set of remedial alternatives to be evaluated in the draft FS (see also Section 5.4 comments).
73	Technology Evaluation - Assignments	Section 7.2 - Remedial Technology Options, page 7-4	The draft FS defines “in-place technologies” to include a “suite of potential in-place technologies” that “could include EMNR (thin-layer sand placement), in situ treatment (placement of AC or a similar reagent onto surface sediments), engineered caps (including armor layers, habitat layers, and/or other variations), or other similar in-place technologies.” The draft FS report suggests that “this level of determination is more than adequate for draft FS purposes, and the specific applications of in-place technologies would be determined during SMA-specific remedial designs based on more detailed engineering evaluations” EPA disagrees with this contention. Site specific factors will determine the effectiveness of these “in-place technologies.” Site specific information should be used to evaluate the overall effectiveness, implementability and cost of the various “in-place technologies” to ensure that the FS develops the appropriate range of technologies and evaluates these in an objective manner consistent with the NCP. The draft FS Report acknowledges the limitations of this assumption by developing two cost estimates one of which “assumes engineered caps in all of the in-place technology subSMAs, while the other cost estimate assumes in situ treatment in all of the in-place technology subSMAs, except the wave zone.” Similar to the need for two cost estimates for engineered caps and in-situ treatment, additional factors related to effectiveness, implementability and cost across the entire range of “in-place technologies” is required.
74	Technology Evaluation - Assignments	Section 8.2.2 - Overall Protection of Human Health and the Environment, pages 8-9 and 8-29	The technology specific subsections presented in this section make general statements about the overall protectiveness of the various remedial technologies. However, because the discussion is so general, it does not provide useful information. For example, under dredging, the draft FS Report states: “environmental dredging/removal may provide moderate to high level of risk reduction and low to moderate residual risk, depending on the effectiveness of dredging and use of backfill material.” While this statement is true, there are numerous site specific factors that come into play such as the concentration left behind, the thickness and type of cover applied, the physiochemical properties of the contaminant, the potential for erosion. Without an understanding of these site specific factors, it is not possible to understand the degree to which removal technologies will reduce risk.

No.	Comment Subject	Reference	Comment
75	Construction Sequencing and Durations	General	The construction sequencing is inappropriate in that it does not address the most contaminated areas first. The durations of construction are also inappropriately constrained by assuming no in-water remedial actions can occur outside the in-water work window. An appropriate sequencing for each alternative that addresses the areas posing the highest risk first, and maximizes technology efficiencies to complete the remedy in the shortest reasonable timeframe should be incorporated into the remedial strategy. The associated cost estimates will need to be revised based on the revised construction sequencing and technology assumptions.
76	Integration of Source Control Measures	General	The effectiveness of the sediment remedy will be closely tied to the effectiveness of upland source control efforts. This is a very challenging technical issue that will require a significant monitoring and adaptive management effort. It should also enter into decisions on implementation schedules for both upland and sediment remedies.
77	Evaluation of Alternatives	General	Explain why concentrations do not decrease as quickly under Alternative F compared to other alternatives. Alternative F would be more effective if it targeted the same areas as the other alternatives for the first ~10 yrs and then continued to clean up additional areas.
78	Evaluation of Alternatives	General	The comparative analysis of alternatives concludes that all alternatives besides No Action are protective & meet sediment RAOs, & that the balancing factor that differentiates between alternatives is short-term effectiveness (i.e., the more you dredge the greater the detrimental impact to the environment). This is largely based on: 1) using site-wide SWACs to evaluate remedial alternatives; 2) the LWG's position that rigid containment during dredging is ineffective and potentially harmful (national problematic applications are discussed in detail, but not the successful local application at Arco); 3) their F&T model that predicts wide-scale natural burial; and 4) that waiting 30+ years for MNR to achieve RAOs/RGs is acceptable. The FS bases a significant portion of the overall effectiveness evaluation on the duration of the cleanup. As a result, remedial alternatives that remove more material or are of a greater duration receive a lower overall score (i.e., the FS presents a bias against removal based remedies). This outcome is based on the failure to properly consider hot spots of contamination, adequacy of controls (which takes into account the amount of material left in place), reductions in toxicity, mobility and volume through treatment and the uncertainty in long-term projections of risk reduction. In addition, the analysis does not properly consider sheet pile installation as a method to reduce water column impacts and perhaps shorten the duration of dredging activities at the site. The evaluation of long-term effectiveness and permanence should consider the uncertainty in long-term projections of risk reduction and consider the effect of robust cleanup actions that result in a rapid decrease in contaminant concentrations on the uncertainty in the long-term risk reduction predictions. Alternatives that permanently remove or isolate more contamination should receive a higher score than alternatives that are projected to reduce contaminant levels through uncertain natural recovery processes that are estimated using contaminant fate and transport models.
79	Evaluation of Alternatives	General	<u>Comparison of alternatives</u> - A lot of the differences between the "i" series & "r" series alternatives are due to "reduction of toxicity through treatment". The LWG argues that "treatment" includes placing a cap with amendments (i.e., GAC) on contaminated sediment. EPA questions the high "treatment" scoring for active capping compared to dredging. It may be "active" capping, but it still capping…, which is largely containment. Additionally, although GAC amendments are proposed as a significant component of many of the "i" alternatives, no specific pilot work has been proposed and detailed information to support selection of this technology is lacking.
80	Evaluation of Alternatives	General	In describing the process options and analyzing the alternatives, there is no reason to lump enhanced MNR (EMNR) and in situ treatment (meaning carbon amendment) together, as these methods can and likely will be done independently of each other.
81	Evaluation of Alternatives	Section 2.2 - Chemical System, page 2-6	<u>The FS focuses on four COCs (i.e., Bounding Chemicals) & benthic toxicity</u> - We agree these four chemicals are the primary risk drivers, but they aren't the only chemicals posing unacceptable risk. Because the FS focuses on indicator chemicals to identify key areas of concern, there should be a "circle-back" to confirm that the selected alternative adequately addresses other chemicals to evaluate if unacceptable levels of other contaminants remain. Risks to the benthic community as estimated through multiple lines of evidence may exist outside the areas of risk identified by the four "bounding chemicals."
82	Evaluation of Alternatives	Section 5.4.2 - Physical Feature Sub SMA Types, Table 5.4-1	The physical features presented in Table 5.4-1 should be expanded to include areas of erosion/deposition, debris areas, areas targeted for future redevelopment, habitat areas, slope, presence of underwater utilities, presence of bedrock outcrops within the sediment bed, hot spots and areas with principle threat material (e.g., NAPL), areas with active upland sources or where source control is required to prevent recontamination.

No.	Comment Subject	Reference	Comment
83	Evaluation of Alternatives	Section 7.1 - Screening the Alternatives, page 7-1	It should be noted that Alternative G was screened out based on area/cost and post remediation SWAC only. The evaluation did not consider the various remedial technologies that would be brought to bear in the areas identified based on the most conservative RALs. This point needs to be acknowledged.
84	Evaluation of Alternatives	Section 8.2.6.1 - Short-Term Effectiveness – MNR, page 8-32	The arithmetic for worker injuries needs to be checked since the number of hours is stated once as two hundred thousand and once as two hundred million. Two hundred million worker hours does not seem plausible and is presumably a typographical error. Also please explain how the number of work hours is derived (what assumptions were made about the number of personnel, etc.). Given the assumptions in Section 7.5 (working 105 days per year during the fish window, 12 hours/day, 6 days/wk), 200,000 worker hours per year implies about 160 construction workers all working overtime (or the equivalent of 286 fulltime workers). Is that what is envisioned?
85	Evaluation of Alternatives	Section 8.3.1 - Overall Protection of Human Health – Alternative A, page 8-37	The discussion of the time to achieve RAOs for Alternative A should be described explicitly. It should be noted that, as documented on Figure 8.2.2-1, that the RG for PCBs of 30 ug/kg is not achieved for either the base case or lower bound scenario.
86	Evaluation of Alternatives	Section 8.4.1 - Alternative B – Overall Protection of Human Health and the Environment, page 8-41	The discussion states that Alternatives B-i and B-r are both projected to achieve long-term PCB smallmouth bass whole body tissue contaminant concentrations that are at or below the most conservative estimates of acceptable risk levels. However, the discussion does not acknowledge the uncertainty in these projections.
87	Evaluation of Alternatives	Section 9 - Comparative Analysis of Risk, pages 9-1 and 9-5	The information presented in Section 9 does not provide a sufficiently detailed comparative risk analysis to support remedial decision making. This is a major shortcoming that permeates the FS. For example, detailed information is presented in Section 6 regarding the expected effectiveness of remedial technologies based on site specific information. However, the information presented in Section 7 does not describe how that analysis is applied within the various AOPCs to develop the remedial action alternatives. Similarly, a lot of information is presented in Section 8 about the tools for performing the detailed evaluation of alternatives but the comparative analysis of alternatives fails to perform this analysis in sufficient detail. For example, the discussion of the Tissue RAO in Section 9.1.2 states: "All of the action alternatives are projected to attain tissue RAOs 2 and 6" and "Dredging actions included in all of the action alternatives are projected to result in elevated tissue PCB concentrations during and immediately following dredging operations due to unavoidable dissolved PCB releases to the water column." Given that all alternatives achieve the RAO and that all short term impacts are expected to be over small areas and time periods, the comparative analysis of alternatives comes down to cost and certainty in achieving the RAO over some time period. Table 9.0-1 does not provide sufficient detail with which to select a remedial action alternative. Except for the no-action alternative, much of the information presented (with the exception of cost, area, CO2 emissions, etc.) does not change until Alternatives E and F which are expected to have greater construction water quality impacts and an increased potential for habitat restoration integration conflicts. For example, the ability to meet RAOs is either yes or uncertain for all alternatives and the time to achieve RAOs is estimated at 0 – 45 years for all alternatives. Table 9.0-1 needs to be revised to provide greater detail regarding the degree to which each alternative will meet RAOs and the time until RAOs are achieved.
88	Evaluation of Alternatives	Section 9.1.1 - Surface Sediment RAOs, page 9-3	The Draft FS States: "In Swan Island Lagoon, all of the action alternatives are estimated to attain similar long-term surface sediment PCB concentrations in the range of approximately 60 to 110 ppb." Please clarify whether this statement includes the proposed CDF or CAD in Swan Island Lagoon, and provide clear back up and analysis of this assertion or modify the assertion.
89	Evaluation of Alternatives	Section 9.5.7 - Potential Impacts to Workers, page 9-32	This analysis is flawed in that if the workers were not working on the remediation of the Portland Harbor site, they would be working on remedial or construction work elsewhere with presumably similar impacts to workers. As a result, the results of this analysis should not be factored into remedial decision making.

No.	Comment Subject	Reference	Comment
90a	Uncertainty and Sensitivity Evaluations	Appendix E	Sensitivity Analysis (human health) - The text in Appendix E is written to give the erroneous impression that the sensitivity analysis was either required by EPA guidance or was conducted "consistent with EPA guidance." However, the sensitivity analysis in the draft FS is not consistent with EPA guidance. A detailed discussion of uncertainties associated with the exposure values used in the BHHRA is already presented in the BHHRA, including a quantitative estimate of the magnitude of the uncertainties on the overall risk estimates. Further, inconsistent with EPA guidance that the LWG cites to in this appendix, no work plan was submitted to EPA for review and concurrence, and the probabilistic reanalysis of the exposure assessment presented here blatantly ignores the recommendation in Section 5.2 of RAGS Volume III that "if only point estimates were used in the risk assessment, probabilistic methods should not be used for PRG development." Contrary to the semantics employed in the draft FS and in Appendix E, there does not appear to be any true sensitivity analysis conducted. By definition, a sensitivity analysis should not change the outcome of the analysis. Rather, it should indicate how the outcome of an analysis responds to perturbations to specific inputs. In contrast, consistent with the statement in Section 2 of the draft FS that "using equally valid assumptions in the risk assessment could have resulted in different PRGs and eventually RGs," the LWG's analysis presented here appears to be nothing more than a thinly veiled effort to circumvent the exposure assumptions used in the BHHRA and replace them with values more to the LWG's liking. Further, the analysis of the human health PRGs and the LWG's errant conclusion that the alternate RGs calculated here are protective of human health is premised on two fundamental errors. The LWG has mischaracterized/misinterpreted the fish consumption rates as used in the BHHRA of 17.5 g/day and 142 g/day as upper percentiles (90th and 99th) for consumers of fish. EPA used these values from national upper percentiles of consumers and non-consumers of fish to represent average consumption rates for actual consumers of fish. By definition, we are not interested in the risks of consuming fish to people who do not consume fish. As acknowledged in the BHHRA, the associated 90th and 99th percentile consumption rates for those individuals who do regularly consume fish are 200 g/day and 504 g/day, respectively. Use of the combined consumer/non-consumer data was premised on the assumption that actual consumption rates of resident fish obtained from Portland Harbor itself, rather than alternate sources, was likely within the range of values encompassed between the respective 90th and 99th percentile rates, particularly since fishing rates in the area are suppressed due to existing fish advisories. **(Comment continued below)**
90b	Uncertainty and Sensitivity Evaluations	Appendix E	**(Continued from Comment #90a)** This mischaracterization of consumption rates as upper percentiles for fish consumers instead of median values has profound implications in the analysis. In a probabilistic evaluation, about one half of the values are expected to be above the 50th percentile, and one half of the values below the 50th percentile. In fact, if fish consumption rates from EPA's exposure factors handbook or other sources are used, the distributions do not appear symmetrical (mean rates are well above median rates), and there is the potential for consumption rates much higher than the median rate. By definition, there are no 0 g/day rates for fish consumers, and it is likely that the fish consumption rate is skewed to the right. In addition, the reanalysis of PRGs cannot be considered protective of human health in that it fails to consider the higher consumption rates associated with subsistence and tribal fishers, or consider calculating PRGs/RGs based on infant exposure to persistent organic pollutants via breast milk. Given that infants are both subject to the greatest exposure to bioaccumulative contaminants such as PCBs, and are also most sensitive to their adverse health effects, RGs calculated to be protective only of adult consumers of fish cannot be considered protective of infant exposure. Thus, the statement made in Appendix E that "The results of the sensitivity analysis demonstrate that there is sufficient scientifically valid evidence that baseline conditions might already meet the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) threshold criterion for overall protection of human health" is unsupported by any information presented in this appendix. Appendix E, Attachment 1A, Ecological RG: The sensitivity analysis of the PCB RG and BERA assumptions about exposure, toxicity, were examined using input parameters that were not a part of the BERA. For example, the risk model was completely different including a new terrestrial prey component for the mink diet. Appendix E contains a flawed analysis that if done correctly would refute the above statements. The appendix is essentially a probabilistic risk assessment that was conducted without involvement of EPA and the other agencies, and which is fundamentally flawed. At the FS meeting in June 2011 when the sensitivity analysis was first presented, EPA instructed the LWG to not include the analysis in the FS because it was in effect a separate risk assessment which is inconsistent with EPA guidance. EPA rejects the sensitivity analysis because the risk model differs from the risk model presented in the baseline risk assessment, it is flawed, and because it is not necessary for remedial decision making.

No.	Comment Subject	Reference	Comment
91	Uncertainty and Sensitivity Evaluations	Section 10.2 - Risk Management Decisions and Uncertainties, page 10-8	**Use of uncertainty and sensitivity evaluations.** The uncertainty evaluation included in the FS is summarized in Chapter 10. The take home message is "The reliability of the MNR technology was evaluated through an uncertainty analysis (Appendix U, Section 5). This evaluation indicated that the natural recovery and modeling uncertainties are small compared to the RG and SMA uncertainties (Figure 10.2-1)." This type of comparison is not scientifically credible. A calibration constrained sensitivity analysis does not represent the uncertainty of a model's predictions for depicting environmental conditions; it represents the variation seen in model results when a few select parameters are varied. Subsequent comparisons to the range of potential remedial goals and the assertion that the comparisons have meaning are not appropriate. The FS should include a more robust evaluation of the uncertainty of MNR to achieve RAOs at the Portland Harbor Site. Delete references to risk management (i.e., Sections 10.1 and 10.2 and associated Appendices) as being beyond the scope of the FS.
92	Uncertainty and Sensitivity Evaluations	General	**Infant exposure pathway -** The infant breastfeeding pathway for PCBs was shown in the human health risk assessment to be a critical exposure pathway. This is inconsistently addressed in the FS (for example, Executive Summary, Figure 3; Section 2.6.4, page 2-45, second to last paragraph; Appendix E). In addition, it is inconsistently addressed in the Risk Management document. In Table 2-1 of the risk management document, the infant exposure pathway is not recommended for consideration in the FS even though this is the most important pathway for PCB exposure. In both documents, the hazard index of 60,000 for the infant exposure pathway is sometimes omitted when the maximum hazard index is discussed. The sensitivity analysis in Appendix E of the FS does not include this important pathway. Valid decisions about the effectiveness of remedial alternatives cannot be made without considering risks to infants.
93	Uncertainty and Sensitivity Evaluations	Appendix Ha, Section 4.1.2.3, page 65	Sensitivity analysis found that the model was not very sensitive to the magnitude of National Pollutant Discharge Elimination System (NPDES) loadings, with exceptions in the immediate vicinity of the discharge locations. Thus in most cases the model predictions can be used, but if MNR is proposed at or near NPDES discharge for copper or BaP, then the use of this sensitivity run must be evaluated. (This applies to Section 6.2.2.1.3 evaluating the likelihood of success of MNR.)
94	Cost Estimates	Appendix K	Review of the cost estimate identified some items that appear to have elevated costs based on general experience: • The production rates for dredging seem a bit slow. • Mob/De-Mob costs seem a little high. EPA would expect to see these costs between 8-10%. However, each contractor builds these costs up differently so please provide basis to build up to the mob/de-mob costs indicating what was included. • Engineering costs seem a little high. Based on our experience, EPA would expect to see them no more than 10% for this type of project. • Daily Responsible Party Oversight and PM seems high. EPA would expect to see a PM, project engineer/site inspector and some administrative support. • Engineering During Construction. $78,000 seems high. Does this represent three or four engineers for the month full time? • Daily Agency Oversight seems high. EPA is unable to determine what is included in the monthly unit rate. • For conceptual level of design, it is typical to carry a 25 - 30% contingency. 40% seems high. Documentation should be provided showing the basis for the assumptions for the items listed above.

No.	Comment Subject	Reference	Comment
95a	Cost Estimates	Appendix K	Review of the cost estimate also identified a number of questions: • We are unable to tell what the cost of indirects are for Insurance, bond, fee, labor overheads, G&A. 5% would be low for environmental bonding, special insurance, General Liability. Please identify these indirect costs. • Subcontractor markup and bonding are not evident. Please identify if these costs are included. • Is there some accounting for the reduced weight of the material for transportation and disposal due to the water draining from the material? • Is there some adjustment for the percent of loss or overages of capping material due to currents? • What type of clamshell will be used? Will an environmental bucket be used? • What method will be used for controlling excavation quantities and grade? • Where are the costs for constructing an offloading cell? • How will the water be managed and where are the costs? • How will the material be transported from the offloading cell to the load out facility? • Are there premium costs included for working at night? • Is there any land-based removal included? • Are there costs included for pre & post surveying work? • Are the costs included to construct the disposal facility? • How will the water be managed for the material that is draining? Are costs included? • Is the cost for the 20 acre facility lease included? • Are the costs for covering and uncovering the stockpiles included? • How many railcars are anticipated? • Are the costs for the mobilization of the cars included? • Are costs for additional track or siding included to stage rail cars? • Are costs included for the lining of the rail cars? **(Comment continued below)**
95b	Cost Estimates	Appendix K	**(Continuation of Comment #95a)** • What are the costs for purchase of and mixing in the diatomaceous earth? • Often the disposal facility has trouble getting the rail cars dumped out and an empty train back. Is there any standby time for the load out crews included? • Typically the disposal facility will only allow what they call unit trains or a number of cars with the same material to be loaded at one time. Will there be room for two full unit trains on site to avoid running out of stockpile room? • Material will need to be stockpiled and sampled for profiling at the disposal facility. Are these samples and sampling costs included? • Where are the costs for water treatment, NPDES permit, and TESC establishment and maintenance? • The unit of Linear Feet (LF) is non-standard for calculating costs. Square Feet (SF) would be easier to evaluate. Please modify to SF where SF is a more common standard. • Will in-water acoustical surveying and monitoring be required for driving sheet pile? If so are the costs included? • Is maintenance included in the costs? Will bubble curtains be necessary? If so are costs included? • There seem to be some possible rounding errors in the spreadsheet. As the factors are in millions, please include a decimal so it is possible to distinguish between the non-discount and the discount after the factors are applied. • EPA is unable to understand why some areas present a range and other areas do not. Please clarify with appropriate reasoning or modify for consistency.
96	Editorial	Section 2.1 - Physical System, page 2-2	Section 2.1 almost exclusively discusses industrialization of the Lower Willamette River within Portland Harbor. While it is true that "this river reach differs substantially from its pre-developed characteristics related to hydrodynamics, sediment transport, and ecological habitat and function" it is also true that the river provides habitat for a range of species including special status species such as salmon and Bald Eagles and that the river experiences frequent recreational uses including boating and fishing. The FS should acknowledge the ecological and recreational functions of the river.